Claims

1. A manipulator comprising a foot part and a number of members connected to the foot part and to each other respectively, and at least a gripper part, such that the members and the gripper constitute, with the foot part, an arm, wherein drive means, in particular motors for moving at least a number of the members and the gripper are provided in the foot part.

2. A manipulator according to claim 1, comprising at least a first member to be referred to as upper arm, movably connected to the foot part, a second member to be referred to as lower arm, movably connected to the upper arm, and a gripper connected to the upper arm, wherein the drive means, in particular motors for moving the upper arm, lower arm and gripper are provided in the foot part.

3. A manipulator according to claim 2, wherein a third member is provided, to be referred to as wrist, included between the second member and the gripper, drive means for the wrist being included in the foot part.

4. A manipulator according to any one of claims 1-3, wherein a first member, in particular the upper arm, is rotatable about a shoulder axis relative to the foot part and a second member, in particular the lower arm, is rotatable about an elbow axis relative to the first member, compensating means being provided which, upon movement of the members, at least partially compensate for the moment exerted thereby relative to the foot part, the arrangement being such that thus, during use, couples acting on a number of drive means are limited.

5. A manipulator according to claim 4, wherein the shoulder axis and the elbow axis, during use, extend substantially parallel to each other and preferably horizontally, and are located adjacent opposite ends of the first member, the gripper being rotatable about at least a

first gripper axis relative to the second member, said first gripper axis preferably enclosing an angle of about 90° with the elbow axis.

6. A manipulator according to claim 4 or 5, wherein the shoulder axis comprises at least a first rotary shaft and a second rotary shaft, the first rotary shaft being coupled to the first member and the second rotary shaft being coupled to the second member, the compensating means comprising a first eccentric coupled to the first rotary shaft and a second eccentric coupled to the second rotary shaft, first and second spring means being coupled to the first and the second eccentric respectively, the eccentrics being directed such that at the maximally reachable horizontal position of the relevant arm part, the force exerted on the relevant rotary shaft by the spring means is maximal and at the maximally reachable vertical position of the relevant arm part, said force is minimal.

7. A manipulator according to claim 6, wherein the spring means comprise a first and a second compression or tension spring which are at least substantially accommodated in the foot part, with a first and a second band-shaped element respectively extending from the springs over the first and second eccentric respectively, the end distal from the relevant spring being fixed in position, the arrangement being such that upon rotation of an eccentric by means of the relevant rotary shaft, the relevant spring changes in length.

8. A manipulator according to any one of the preceding claims, wherein the drive means comprise a series of motors, each motor being coupled to a reduction casing aligned therewith, the reduction casing being connected to a drive wheel connected, via transmission means, to one of a number of drive shafts, included in or adjacent a shoulder, of parts to be driven, in particular the members such as upper arm, lower arm, wrist or gripper.

9. A manipulator according to claim 8, wherein a number of reduction cases are mutually identical, each connected to

a drive shaft mounting the relevant drive wheel, the assemblies of reduction casing and drive wheel differing from each other only by the position of the drive wheel relative to the relevant motor.

10. A manipulator according to any one of the preceding claims, wherein at least the first member is at least partially hollow, a series of first drive shafts extending from the foot part into the first member, a series of second drive shafts being provided in the second member, said drive shafts being fitted coaxially one within the other, while between the shafts, a number of bearing means are included or formed, a number of the first shafts at the end remote from the foot part being provided with a first drive wheel, while a number of the second shafts are provided with a second drive wheel, a first drive wheel in each case being drivingly connected, via a coupling element, to a second drive wheel, the drive means in the foot part being arranged for driving the respective first drive shafts, the arrangement being such that both the first member and the second member is movable via the first drive shafts.

11. A manipulator according to claim 10, wherein the second member comprises a series of third shafts, whose longitudinal direction extends approximately at right angles to the longitudinal direction of the second shafts, a number of the second and third shafts being provided with mating, preferably frustoconical gears for transmitting rotational movements of the relevant second shafts to the relevant third shafts, at least a number of the third shafts being connected to a third member to be referred to as wrist, movably connected to the end of the second member remote from the first member.

12. A manipulator according to claim 11, wherein the gripper is provided on the side of the wrist remote from the first member and is biased in an open position, while a spring element extends through the wrist, on one side connected to a block slidable in longitudinal direction of

the first member through rotation of one of the third shafts, and on the other side connected to the gripper, such that upon rotation of the relevant third shaft, the block is displaced in longitudinal direction while displacing the spring element and/or changing the length thereof, enabling the gripper to be pulled from the open position into a closed position and vice versa.

13. A manipulator according to any one of the preceding claims, wherein the foot part comprises a foot plate which, by means of a bearing, is rotatably connected thereto adjacent the lower end of the foot part, a number of sliding contacts being provided for transmitting an electric tension between the drive means and a power supply located outside the foot part and, possibly, a control unit.

14. A manipulator according to claim 13, wherein the bearing for the foot plate comprises an annular groove in the outer circumference of the foot plate and a corresponding annular groove on an inner surface of a tube of the foot part, the relevant outer circumference of the foot plate being substantially identical to the relevant inner circumference of the tube and both grooves having a substantially V-shaped section, such that the two grooves together define a ball track of a substantially rectangular, in particular square or diamond-shaped section which includes a series of balls whose describing line corresponds to said section of the ball track.

15. A manipulator according to claim 14, wherein an opening is provided in the tube, said opening ending in the ball track and having a passage which is approximately equal to the cross section of the balls, closing means being provided for closing said opening after insertion of the balls.

16. A manipulator according to any one of the preceding claims, wherein the foot part is substantially formed from a substantially tubular extrusion section, recesses being provided for the drive means.

17. A manipulator according to any one of the preceding claims, wherein spaces are provided in the foot part for accommodating spring means for compensating means, electronic components and the like.

18. Use of a manipulator according to any one of the preceding claims in a space unsuitable for human entry, such as a radiation space or a toxic space.